Original Article

Factors Related to Complaints of Lung Function Disorders In UPN Veteran Jakarta Employees

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Abstract

Background: One characteristic of lung dysfunction is obstruction of airflow in the respiratory tract. The prevalence of COPD as lung function disorder among men in Indonesia is 3.7% and 2.7% in DKI Jakarta. One of the causes of decreased lung function is smoking. A large portion of UPN Veteran Jakarta employees is smoker. This research was aimed to determine risk factors of lung dysfunction among employees in UPN Veteran Jakarta.

Method: A cross sectional study was conducted from April to May 2019 in UPN Veteran Jakarta. Total 102 samples of employees who work at UPN includes staff, lecturers, cooperative officers, office boys, and security guards were selected using purposive sampling. Measuring instruments used in this study were questionnaires, scales, microtoise and spirometer. Spirometer was used to measure lung function. Questionnaires to obtain data on gender, age, body mass index (BMI), employment status, education, allergies, history of lung disease, family history, Brinkman index, physical activity, vehicle emissions exposure and smoking environment. The data was analysed using the chi square test and logistic regression test

Results: The results of the logistic regression test showed risk factors of lung dysfunction were BMI (POR: 4.718; 95% CI 1.673-13.305), history of lung disease (POR: 3,424; 95% CI 0.836-14.028) and smoking environment (POR: 2.956; 95% CI 0.953-9.168).

Conclusion: The most influencing factors for lung dysfunction were BMI, history of lung disease, and smoking environment.

Keywords: risk factors, employees, lung dysfunction

INTRODUCTION

One of the lung function disorders is chronic obstructive pulmonary disease (COPD). It is a chronic lung disease characterized by obstruction of air flow in the airways which is progressive, non-reversible or partially reversible.[1] Disorders of the respiratory tract can be in the form of pulmonary function disorders that are obstructive, restrictive and mixed in the form of asthma, lung cancer, mediastinal tumors, tuberculosis, pneumonia and Chronic Obstructive Pulmonary Disease

(COPD).[2] The symptom is a cough for a duration of three months in a year which is experienced at least in two consecutive years and is not caused by other diseases. Emphysema occurs starting with the widening of the air cavities distal to the terminal bronchioles and damage to the walls of the alveoli.[3]

World Health Organization (WHO) in 2013 noted that COPD became the fifth disease with the highest prevalence worldwide, the death rate from this disease continues to increase every year. Chronic obstructive pulmonary disease along with asthma, acute lower respiratory tract infections, tuberculosis and lung cancer are the leading causes of death worldwide. The worldwide prevalence in the moderate to severe category mostly occurs at the age of more than 30 years at 6.3%.[4] Riskesdas showed that the prevalence of COPD in Indonesia in 2013 was 3.7% in men with the prevalence in West Java reaching 4%. While the prevalence of asthma at all ages in Indonesia reached 2.4% and the prevalence of asthma in West Java was around 2.8%.[5]

The main factors of COPD contributing as an irreversible lung function disorder are age, smoking habits, and air pollution. Currently, the number of young smokers, indoor air smokers and outside the workplace smokers are increased. Based on the results of the Indonesian Organization for Economic Co-operation and Development (OECD) economic survey Indonesia has a number of smokers which is high among men about 75% in all age categories but the lowest is among women about 3%.[6]

Research in America states that someone who has a history of asthma will increase the risk of losing lung function more quickly than individuals without a history of the disease.[7] Another study in London, England stated that the prevalence of asthma and bronchial hyperresponsiveness was higher in office boy workers than office workers. Lung function in janitors who have a history of asthma or asthmatics who have a smoking habit have a high risk, as well as office workers who have a history of asthma who have a smoking habit have a high risk of decreasing lung function. The results found that asthma in cleaning workers was accompanied by symptoms of productive cough, leading to chronic bronchitis, in a higher proportion than asthma in office workers.[8]

UPN Veteran Jakarta (UPNVJ) is a state government educational institution, in which employees support the activities of the academic community consisting of staff, lecturers, cooperative officers, office boys/girls and security guards. The working hours of employees are eight hours of work with one break from 12 PM until 1 PM. Employees who are often exposed to dust, motor vehicle fumes and cigarette smoke during working hours are office boys/girls and security guards.

Observations made before the primary study found that there were potential factors that could cause lung function abnormalities already existed in employees who worked in the UPN Veteran

Jakarta environment such as smoking behavior, exercise habits, history of disease (asthma and Acute Respiratory Infections or ARI), and pollution (motor vehicle fumes and smoking environment). However, measurement of lung function or identification of risk factors for lung disorders has not been carried out in employees who work in the UPN Veteran Jakarta environment.

Based on medical record data in the past year at the UPN Veterans Jakarta polyclinic, there were several respiratory complaints such as dry cough, cough, cough with phlegm, headache (cephalgia), influenza and asthma. The highest frequency of visits there are chief complaints of cough and cold. Regarding the follow-up to the decrease in lung function, no further diagnosis has been made for employees. Therefore, it is necessary to research the factors associated with decreased lung function in employees working in UPN Veteran Jakarta.

METHOD

This cross-sectional study was conducted from April to May 2019 with a sample of 102 employees working within the UPN Veterans Jakarta including staff, lecturers, cooperative officers, office boys/girls, and security guards. The sample was selected using purposive sampling with inclusion criteria having worked at UPNVJ for at least 1 year, willing to be a respondent, aged 20-70 years. Meanwhile, the exclusion criteria were if they were not willing to participate or did not fill out the questionnaire completely.

A modified questionnaire was used to obtain data on host factors (gender, age, body mass index (BMI), employment status, education, allergies, history of lung disease, family history), behavioral factors (smoking and physical activity) and environmental factors (frequency of emission of vehicle and smoking environment). Smoking behavior was assessed based on the Brinkman Index (IB). Pulmonary function abnormalities were determined based on the results of spirometry measurements. It is stated that there is an abnormality/decrease in lung function if the VEP_1 value is <80%.

Lung function is measured using portable spirometer. Subjects were asked not to smoke 30 minutes prior to measurement. The subject performs maneuvers with the maximum expiratory flow speed that can be achieved when forced expiration in a sitting position. Subjects were asked to inhale as much as possible, then exhale with maximum force as soon as the lips were pressed against the mouthpiece. Measurements were conducted 3 times and the highest results were taken.

The data that has been collected was analyzed using data analysis software. Chi Square test was used for the selection of candidate variables which were included in multivariate analysis. For multivariate analysis, logistic regression was used with Prevalence Odds Ratio (POR) as a risk measure.

This research has been approved by the ethics committee of the Jakarta Veterans National Development University with the number B/1921/5/2019/KEPK.

RESULTS

This study found a high proportion of employees experiencing decreased lung function as much as 64.71% (Table 1).

Table 1. Overview of Lung Function Abnormalities

FEP_1	N	%
<80%	66	64,71
>=80%	36	35,29

Based on Table 2 shows that the highest proportion is found in male gender (81.4%), age < 40 years (64.7%), normal BMI (56.9%), working as an office boy (41.2%), had high school education (68.6%), had no respiratory allergies (94.1%), had no history of lung disease (81.4%), and had no family history of lung disease (81.4%). The highest proportion was found in light smoking based on Brinkman Index (IB) (69.6%) and moderate physical activity (66.7%). Most respondents were exposed to motor vehicle emissions (63.7%) and were in a smoking environment (80.4%).

The Chi-square test showed insignificant results on the occurrence of lung function abnormalities for the variables of gender, age, employment status, education, allergies, history of lung disease, and family history with P>0.05. While BMI (P=0.002) there is a significant association with lung function abnormalities (Table 3).

Table 2. Demographics of Host Factors, Behavioral Factors and Environmental factor

Variable	N	%
Gender		
Female	19	18,6
Male	83	81,4
Age		
≥40 years	36	35,3
<40 years	66	64,7
BMI		
Obesity	7	6.9
Overweight	21	20.6
Thin	16	15,7
Normal	58	56.9
Occupation status		
Staff	25	24,5
Lecturer	7	6,9
Cooperative Officer	8	7,8
Office boy/ girl	42	41,2
Security	20	19,6
Education		
Junior high school	11	10,8
Senior high school	70	68,6
College	21	20,6
Allergic		
Yes	6	5,9
No	96	94,1
History of lung disease		
Yes	19	18,6
No	83	81,4
Family history of lung disease		
Yes	19	18,6
No	83	81,4
Smoking Behavior (Brinkman Index)		
Light Smoker (0-199)	71	69,6
Moderate Smoker (200 - 599)	26	25,5
Heavy Smoker (>600)	5	4,9
Physical Activity		
Enough	68	66,7
Not enough	34	33,3
Motor vehicle emission frequency		
At risk	65	63,7
No Risk	37	36,3
Smoker Environment		
At risk	82	80,4
No Risk	20	19,6

The proportion of heavy smokers who had lung function abnormalities was 74.2%. Meanwhile, the proportion of physical activity did not differ between groups. These two variables have no relationship to lung function abnormalities (Table 4).

The proportion of exposure to vehicle emissions at risk was higher than the group exposed to no risk. The proportion of respondents who are in a smoking environment is higher than those who do not have smokers in their environment. The two variables were not associated with lung function abnormalities (P>0.05) (Table 5).

Table 3. Relationship between Host Factors and Lung Function Abnormalities.

Variable	Lung Function Abnormalities				P	POR	CI 95%
	Yes		No				
	N	%	N	%			
Gender							
Female	13	68.4	6	31.6	0.787	0.881	0.300 - 2.589
Male	59	71.1	24	28.9			
Age							
≥40 years	26	72.2	10	27.8	0.824	1.13	0.460 - 2.777
<40 years	46	69.7	20	30.3			
BMI							
Abnormal	38	86.4	6	13.6	0.002*	4.471	1.633 - 12.240
Normal	34	58.6	24	41.4			
Occupational Status							
High	50	71.4	20	28.6	0.817	1.136	0.458 - 2.822
Low	22	68.8	10	31.3			
Occupation							
Moderate	57	70.4	24	29.6	1.000	0.95	0.329 - 2.742
High	15	71.4	6	28.6			
Allergic							
Yes	5	83.3	1	15.7	0.668	2.164	0.242 - 19.353
No	67	69.8	29	30.2			
History of lung disease							
Yes	16	84.2	3	15.8	0.175	2.571	0.690 - 9.586
No	56	67.5	27	32.5			
Family history of lung disease							
Yes	12	63.2	7	36.8	0.419	0.657	0.230 - 1.876
No	60	72.3	23	27.7			

Table 4. Relationship between Behavior Factor and Lung Function Abnormalities

Variable	Lung Function Abnormalities				P	POR	CI 95%
	Yes		No				
	N	%	N	%			
Smoking							
Heavy	23	74,2	8	25,8	0,64	1,29	0,500 - 3,334
Light	49	69	22	31			
Physical Activity							
Enough	24	70,6	10	29,4	1	1	0,405 - 2,468
Not enough	48	70,6	20	29,4			

Table 5. Relationship between Environmental Factor and Lung Function Abnormalities

Variable	Lung Function Abnormalities				P	POR	CI 95%
	Yes		No				
	N	%	N	%			
Motor vehicle emission frequency							
At risk	49	75,4	16	24,6	0,18	1,864	0,780 - 4,457
No Risk	23	62,2	14	37,8			
Smoker Environment							
At risk	61	74,4	21	25,6	0,105	2,377	0,865 - 6,531
No Risk	11	55	9	45			

Table 6. Factors Affecting Lung Function Abnormalities

Variable	B	P	POR	CI 95%	
				Lower	Upper
BMI	1,551	0,003	4,718	1,673	13,305
History of lung disease	1,231	0,087	3,424	0,836	14,028
Smoking environment	1,084	0,061	2,956	0,953	9,168
Constant	-0,712	0,205	0,491	-	-

Multivariate analysis was conducted to find the most dominant factors to lung function abnormalities. By performing a logistic regression test backwards on 12 variables, it was found that 3 variables that most influence lung function abnormalities.

Based on the final model with column B in Table 6 above, get a formula to determine the magnitude of the risk of respondents who have complaints of Chronic Obstructive Pulmonary Disease (COPD). Obtain the formula for the risk of COPD complaints:

Y = -0,712 + 1,551(IMT) + 1,231(RPP) + 1,084(LP)

Note: BMI = Body Mass Index; RPP = History of Lung Disease; LP = Smoker's Neighborhood

DISCUSSION

This study shows that subjects with pulmonary function disorders are greater than those without functional disorders. This can be explained due to the average subject is men aged less than 40 years who have smoking behavior and the smoking environment is less prevalent. This group is vulnerable to developing COPD in the future. Most subjects worked as office boy/girl (41.2%). This is in accordance with research conducted by Zock et al. The subjects in this study were female office workers by 67% and female cleaning workers (83.6%).[8] Most of the subjects were high school graduates occupying position as security guards and office boys/girls. Most subjects do not have allergies related to lung disease, history of lung disease and genetics of lung disease because on average the respondents are healthy and productive people, however, they still have the risk of developing lung function disorders.

Based on the Chancellor of UPN Veterans Jakarta Regulation No. 11 (2019), it is stated that UPNVJ is a smoke-free area[10] however, the smoking behavior of the subject is still quite highwith light smokers as high as 69.6%. This can have an impact on health, especially COPD complaints because the main cause of COPD leads to the prevalence of tobacco

smoking.[10] Subjects had sufficient activity of 66.7%, because some of the subjects admitted that they always followed the routine gymnastics program scheduled every Friday on campus.

Many respondents in this study are bikers because the campus is located on a road with high level of congestion during rush hours from work and after work. Those subjects frequently did not wear mask while riding a motorcycle. This can cause the subject to be exposed to the risk of the frequency of motor vehicle emissions. Subjects who are at risk of being exposed to the frequency of motor vehicle emissions are 63.7%.

Although there is already a Regulation of the Chancellor of the UPN Veterans Jakarta No. 11 of 2019 regarding the smoking ban, this has not been implemented by the subject in the campus environment. Subjects smoked while eating together in an environment near campus. There are some subjects who do not smoke, and they are in that environment, so they are exposed to secondhand smoke. Passive smoking behavior among employees is still quite high at 80.4%.

This study shows that the male sex tends to have lung function abnormalities by 71.1% with P=0.787. The results of P>0.005 can be concluded that there is no significant relationship between gender and lung function abnormalities. Riskesdas in 2013 stated that the prevalence of male COPD is higher than the prevalence of female COPD.[11] In the age group <40 years, 46 respondents (69.7%) had pulmonary function disorders with a P=0.824, with this result, P>0.005, that there was no significant relationship between age and lung function disorders. World Health Organization in 2013 stated that the prevalence of COPD in people aged 30 years and over was 6.3% worldwide.[4] Body mass index (BMI) obtained P=0.002, meaning that there was a significant relationship between BMI and pulmonary function abnormalities. According to research by Ederina et al, COPD sufferers tend to experience malnutrition, underweight and drastic weight loss. Body weight can affect the maximum volume of air that can be accommodated by the lungs, because the lower the body weight or normal weight, the better the air that can be accommodated by the lungs.[12]

Analysis of the relationship between work status variables and pulmonary function disorders obtained P=0.817, meaning that there was no significant relationship between occupational status and pulmonary function disorders. This is in line with Prazasta's research that there is no relationship between work status, whether working or not working with COPD.[13] Socio-economy may be a risk factor for COPD, but there are other linkages such as poor ventilation, poor nutrition and smoking culture.[14]

Analysis of the relationship between education and lung function disorders with P=1.000, meaning that there is no relationship between the last education factor and lung function disorders. This is in line with research conducted in Yogyakarta that there is no significant relationship between education and

patients with chronic obstructive pulmonary disease (COPD) at the Yogyakarta pulmonary disease treatment center with P=0.754.[15] Based on the results of Riskesdas (2013) the prevalence of COPD tends to be higher in people with low education levels and the lowest ownership quintile index.[11]

The relationship between respiratory allergy-related factors and lung function abnormalities obtained P=0.668, meaning that there is no significant relationship between respiratory-related allergic factors and lung function abnormalities. Allergies mentioned in questionnaire are allergies related to dust or animal dander. According to from Suma'mur dust of a certain size when inhaled into the lungs will be retained and buried in the upper respiratory tract and settles in the bronchioles until the alveoli can cause a decrease in lung function. This variable is not in line with the theory because very few respondents have allergies related to breathing (dust and star feathers) and not all people who have allergies related to breathing have lung function abnormalities.[16]

The relationship between the history of lung disease and lung function abnormalities obtained P=0.175, meaning that there was no significant relationship between the history of lung disease and lung function abnormalities. This is also not in line with Budiono's thesis which states that there is a relationship between a history of lung disease and impaired lung function (P=0.015) with respondents who have a history of lung disease 2.1 times more at risk of developing pulmonary disorders.[17] Research in America states that someone who has a history of lung disease will have a greater risk of losing lung function significantly.[7]

Analysis of the relationship between genetics and lung function disorders obtained P=0.419, meaning that there is no significant relationship between genetic/hereditary factors and lung function disorders. The main genetic factor is the lack of alpha 1 antitrypsin, namely serine protease inhibitors or substances that can inhibit the breakdown of peptide bonds between amino acids.[14]

The relationship between smoking behavior and lung function abnormalities obtained P=0.645, it can be concluded that there is no relationship between smoking behavior factors and lung function disorders. This is not in line with the research of Tana et al. which found that there is a significant relationship between smoking and lung function abnormalities with P=0.0001.[3]

Analysis of physical activity with pulmonary function abnormalities in UPN Veteran Jakarta employees found that respondents with moderate physical activity had lung function disorders of 70.6%, while respondents who lacked physical activity had 70.6% of lung function disorders. Exercise can increase the vital capacity of the lungs even if only slightly, but if the vital capacity of the lungs increases it will cause the air entering or leaving the lungs to decrease.[18]

The results of the analysis of the relationship between the frequency of motor vehicle emissions with lung function

disorders obtained P=0.180, meaning that there is no relationship between the frequency of motor vehicle emissions and lung function disorders. PPE can decrease the risk of motor vehicle emissions. Air pollution can cause disruption of body functions, one of which is COPD. Substances that affect the most are sulfur oxides, nitrogen dioxide and ozone.[14]

Analysis of the relationship between environmental factor and lung function abnormalities obtain P=0.105, it can be concluded that there is no relationship between smoking environmental factors and lung function disorders. Respondents who are at risk of smoking or passive smoking are 2.3 times more likely to have lung function abnormalities than those who are not at risk of smoking. Secondhand smoke increases the risk of respiratory symptoms and chronic obstructive pulmonary disease (COPD) and inhaling air containing cigarette smoke can affect fetal growth and even infertility.[19]

The most influential variables on pulmonary function abnormalities in UPN Veteran Jakarta employees are Body Mass Index (BMI), history of lung disease and smoking environment. The results of the multivariate analysis showed that an abnormal body mass index statistically affected the risk for lung function abnormalities. The results of this study support the previous research (thesis) conducted by Budiono on car painting employees. Meanwhile, 25.7% had impaired function in normal nutritional status. Patients with chronic obstructive pulmonary disease experience malnutrition due to loss of lung muscle mass and decreased ventilation capacity. If protein intake is lacking, the body will break down respiratory proteins.[17]

The results of the study at the Arifin Achmad Hospital Pekanbaru stated that COPD patients tended to be malnourished, underweight from BMI, weight loss and 19-60% of COPD patients were declared malnourished.[12] Body weight affects the vital capacity of the lungs, because the higher the body weight or body mass, the worse the lung capacity. This is because overweight and obese people have a lot of saturated fat that can clog the respiratory tract and obese and obese people rarely exercise or do physical activity.[20]

The results of multivariate analysis in this study showed that someone who had a history of lung disease was 3.4 times more likely to have lung function disorders than someone who had no history of lung disease. Examples of history of illness suffered by a small number of employees are asthma 3.9%, ARI 4.9%, pulmonary TB 5.9% and pneumonia 3.9%.

This study is in line with previous research conducted by Budiono which stated that subjects with a history of lung disease were 62.5% and subjects who did not have a history of lung disease were 42%. Decreased lung function in a person as a result of abnormal lung growth during childhood or adolescence, this is related to increasing the risk of COPD complaints in that person.[17] Research in America states that if someone who has a history of lung disease will have a greater risk of losing

lung function than people who do not have a history of lung disease.[7]

The results of the multivariate analysis obtained on this variable indicate that someone who has a risk of smoking environment within the scope of colleagues or family is 2.9 times more at risk of having lung function disorders than someone who is not at risk of having a smoking environment within the scope of work friends or family. The picture of cigarettes causing damage to the respiratory tract is a depiction of the way harmful irritants contained in cigarettes enter the respiratory tract. These irritants can burn the lung cilia, which can lead to infection.

In other words, smoking can cause airway constriction thereby increasing the risk of airway abnormalities and the incidence of COPD.[21] The effects of passive smoking are bad odors, psychological effects, stroke, watery eyes (blindness), lung cancer, COPD, asthma, arterial blockages, heart attacks, angina, low baby weight, miscarriage, and complications during pregnancy give birth.[14]

Based on the formula obtained by someone who has 3.1 times more risk if that person has an abnormal BMI, has a history of lung disease and is at risk for smoking environment.

CONCLUSION

The prevalence of pulmonary function disorders in UPN Veteran Jakarta employees in 2019 was 70.6% who experienced COPD complaints. The results of the logistic regression test get the formula Y = -0.712 + 1.551 (BMI) + 1.231 (RPP) + 1.084 (LP), meaning that if a person has an abnormal BMI, there is a history of lung disease and environmental risk, smokers have 3.1 times more risk of lung sound abnormalities.

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